

**Assessment of the Internal Noise
Climate Within Plot 1 on the Victoria Avenue development,
Higher Blackley, Manchester.**

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Appendix 1. Standardised Internal Noise Levels

1.0 Summary

Planning permission was obtained in February 2021 permitting the construction of 25 new residential dwellings on a parcel of land to the South of Victoria Avenue in Higher Blackley, Manchester. The planning permission document contained a number of conditions one of which, condition 16, required that the development be completed in accordance with the mitigation measures specified within the Millar Goodall Acoustics 'Noise impact Assessment' report, issued in August 2019. In addition planning condition 16 also required that a report to confirm the incorporation of the recommendations contained within the noise impact assessment and detailing the results of testing to confirm that the internal noise levels specified within the 'Noise Impact Assessment' report had been met, was to be provided.

As the development is approaching completion, Druk Limited was commissioned to undertake an assessment of the internal noise climate within plot 1 of the development on Victoria Road.

Measurements of the internal noise climate resulting from external noise break-in were undertaken within plot 1 on the Victoria Avenue development in Higher Blackley, Manchester. The results of the break-in noise assessment demonstrated that the internal noise climate within the front and rear bedrooms and the living room, complied with the design guide values contained within the 'Noise Impact Assessment' report. As such, it is suggested that the requirement contained within planning condition 16, has been complied with.

Report Prepared by:



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2.0 Introduction

Planning permission was obtained in February 2021 permitting the construction of 25 new residential dwellings on a parcel of land to the South of Victoria Avenue in Higher Blackley, Manchester. The planning permission document contained a number of conditions one of which, condition 16, required that the development be completed in accordance with the mitigation measures specified within the Millar Goodall Acoustics 'Noise impact Assessment' report, issued in August 2019. In addition planning condition 16 also required that a report to confirm the incorporation of the recommendations contained within the noise impact assessment and detailing the results of testing to confirm that the internal noise levels specified within the 'Noise Impact Assessment' report had been met, was to be provided.

As the development is approaching completion, Druk Limited was commissioned to undertake an assessment of the internal noise climate within plot 1 of the development on Victoria Road.

3.0 Site Description

The new residential development at Victoria Avenue in Higher Blackley is located to the South of Victoria Avenue between Plant Hill Road and Kingsmead Mews. The layout of the new development is as detailed in figure 1 below. To the North, East and West of the development is Victoria Avenue itself with the existing residential dwellings and St Clare's Church beyond (photographs 1, 2 and 3 overleaf).

Figure 1. Location of the residential development on Victoria Avenue



Photograph 1. Victoria Avenue, to the North of the development



Photograph 2. Looking East along Victoria Avenue



Photograph 3. Looking West along Victoria Avenue



4.0 Assessment Criteria

As previously detailed, the original planning permission granted in February 2021 contained a number of conditions relating to the development of which one, condition 16, dealt specifically with the acoustic conditions within the apartments. The full text of this condition is detailed below:

- 16) (a)** The development hereby approved shall be carried out in accordance with the noise impact assessment stamped as received by the City Council, as Local Planning Authority, on the 20 January 2020.
- (b)** Prior to the first occupation of the development, a verification report shall be submitted for approval in writing by the City Council, as Local Planning Authority, in order to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing to confirm the noise criteria has been met.

In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ. Reason: To secure a reduction in noise from traffic, trams or other sources in order to protect future residents from noise disturbance pursuant to policies SP1, H1 and DM1 of the Core Strategy (2007) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995).

With respect to the noise impact assessment referred to by Manchester City Council, this report was produced by Millar Goodall Acoustics in August 2019 and hereafter referred to as the 'noise impact assessment'. The 'Noise Impact Assessment' report detailed the results of a 24 hour noise survey on the then proposed development site, conducted between the 15th and 16th May 2019. Based on the results of the noise measurements, the 'Noise Impact Assessment' report detailed the building fabric sound insulation measures that would be necessary to achieve the internal sound levels detailed within section 6 of the 'Noise Impact Assessment' report. With reference to the internal sound levels to be achieved within the development, guidance was obtained from: Manchester City Council's *Planning & Noise Technical Guidance* (December 2015), the ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development – document issued in May 2017 and BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

The general guidance relating to the internal sound levels within the dwellings contained within the various guidance documents, including BS 8233:2014 and the ProPG document referred to by the 'Noise Impact Assessment' report is very similar in the various documents. With this in mind table 1 below, containing the relevant extract from BS 8233:2014, details the guide values for internal noise levels which were adopted in the 'Noise Impact Assessment' report.

Table 1. Indoor ambient noise levels for dwellings (reproduced from table 4 of BS8233:2014)

Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35dB $L_{Aeq, 16 \text{ hour}}$	-
Dining	Dining room/area	40dB $L_{Aeq, 16 \text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq, 16 \text{ hour}}$	30dB $L_{Aeq, 8 \text{ hour}}$

With reference to the night time situation, between 23:00 - 07:00 hours, both the Manchester City Council guidance and the ProPG guidance suggest that individual noise events, expressed as an $L_{Amax,F}$, should not exceed 45dB on more than 15 occasions per night (Manchester City Council guidance) or 10 occasions per night (ProPG guidance).

With respect to the building fabric sound insulation measures that were deemed necessary to achieve the internal sound levels detailed above, the noise impact assessment provided an appropriate specification for both the glazing and background ventilators. The appropriate glazing and background ventilator specifications were contained within Section 8.4 of the 'Noise Impact Assessment' report and the relevant paragraphs are reproduced below:

8.4 Mitigation for Achieving Good Acoustic Design

- 8.4.1 In order to assess the potential glazing and ventilation requirements for dwellings, noise ingress calculations were undertaken based on the methodology in BS EN 12354-3¹³. 'Normal' internal surface finishes (e.g. carpeted with curtains etc) were assumed in the calculations.
- 8.4.2 For living spaces (ground floor), predicted daytime L_{Aeq} levels have been used to calculate internal noise levels. For night-time periods, predicted night-time L_{Aeq} and L_{Amax} levels (calibrated to the typical L_{Amax} level of 74 dB) were used. The façade design for the bedrooms is driven by the L_{Amax} limits as they are more onerous (i.e. meeting internal L_{Amax} limits will ensure that the night-time L_{Aeq} limits are also met).

- 8.4.3 Octave band frequency data were obtained from the 3D model and used in noise ingress calculations to determine glazing and ventilation requirements. The data are provided in Table 7, below. Houses of the same type with similar external levels have been grouped together, but the worst-case external levels are used in each calculation (so internal levels in some houses may be slightly lower but should not be any higher than those predicted).
- 8.4.4 The assessment assumes the following external wall and roof constructions:
- Double leaf brickwork with 50 mm cavity
 - Slate tiled roof with 2x12.5 mm dense plasterboard ceiling and 100 mm mineral fibre insulation in 300 mm cavity.
- 8.4.5 If lighter wall and roof constructions are used then the glazing and/or ventilator specifications may need to be enhanced in order to meet the internal limits.

Table 9: Minimum glazing and ventilation specifications

Option	Glazing specification ($R_w + C_{tr}$)	Ventilator specification ($D_{ne,w}$)
1	27 dB (e.g. 4/12/4)	27 dB
2	27 dB (e.g. 4/12/4)	33 dB
3	27 dB (e.g. 4/12/4)	38 dB
4	29 dB (e.g. 6/12/6)	41 dB

A summary of the acoustic mitigation measures was also included within Appendix 3a of the 'Noise Impact Assessment' report, and this is reproduced on figure 2 overleaf. As can be seen from figure 2 overleaf, the various glazing and ventilation specifications for the respective façades of the dwellings on the development were described as conforming to options 1 - 4, with the relevant options being colour coded.

Figure 2. Appendix 3a reproduced from the 'Noise Impact Assessment' report**Appendix 3a: acoustic mitigation requirements for ground floor and gardens****5.0 Noise Climate Assessment Details**

In accordance with the requirement contained within planning condition 16b, a noise survey to evaluate the internal noise climate within a representative dwelling on the Victoria Avenue development was undertaken. With reference to the plot utilised for the survey, plot 1 was selected as this was complete, on the boundary of the development directly facing Victoria Avenue and was closest to the parade of shops and the bus stop (photograph 4 overleaf). Consequently, it is suggested that plot 1 was exposed to potentially the highest sound levels during both the day and night time periods.

5.1 Survey Times and Personnel

As the Victoria Avenue site is still an active site measurements made during normal site working hours, around 07:00 - 16:00 hours, would include contributions from construction noise that would be absent on completion of the development. As such, and in order to obtain a representative assessment of the potential break-in of general noise from the surrounding environment, measurements were made between 16:00 - 07:00 hours to exclude and construction noise contribution. To this end the assessment of the internal noise climate within plot 1 was undertaken between 16:00 hours on Monday 15th April to 07:00 hours on Tuesday 16th April 2024.

Photograph 4. Location of plot 1 on the Eastern end of the Victoria Avenue development



5.2 Weather

At the commencement of the internal noise measurements, the external weather conditions were as follows:

All surfaces were dry, cloud cover was approximately 40%, the external temperature was approximately 10°C, the barometric pressure was approximately 992mb and the average wind speed was 1.9m/s gusting to around 3.9m/s.

5.3 Equipment

The noise assessments were conducted using the equipment detailed in the table 2 overleaf.

The sound level meters were field calibrated before, after and during the surveys as necessary, during which time no significant deviation in the calibrated level was observed.

All the equipment used is calibrated by a UKAS accredited calibration laboratory.

Table 2. Equipment used during the noise survey

Equipment description	Manufacturer	Model number	Serial number
Sound level meter	Norsonic AS	Nor 140	1402738
Microphone pre-amplifier	Norsonic AS	Nor 1209	12075
Microphone	Norsonic AS	Nor 1225	72843
Acoustic calibrator	Norsonic AS	Nor 1251	31522
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E
Microphone pre-amplifier	NTI Audio	MA220	5537
Microphone	NTI Audio	M2230	8636
Sound level meter	NTI Audio	XL2-TA	A2A-23832-E1
Microphone pre-amplifier	NTI Audio	MA220	141157
Microphone	NTI Audio	M2230	A26843

5.4 Measurement Procedure

With respect to the internal measurements, due regard was paid to the guidance provided within the Association of Noise Consultants (ANC) – Measurement of Sound Levels in Buildings, Version 1.0, June 2020.

Plot 1 is a two storey, three bedroom detached house with a living room, kitchen, utility room and toilet on the ground floor and three bedrooms and a bathroom on the first floor. Measurements of the internal noise climate within plot 1 were made within the living room (facing Victoria Avenue), the front bedroom (facing Victoria Avenue) and the rear bedroom (facing the interior of the residential development). These rooms were selected as they would provide an indication of the internal noise climate on both the front and rear elevations of the plot.

Throughout the internal noise assessments the measurement time interval was 5 minutes, the windows were closed but the ventilation provision was open and all measurements were made with the fast time weighting engaged. During the course of the assessments, the sound level meter microphones were tripod mounted, such that they were approximately 1.2 metres above floor level and approximately 1.0 metre from the internal walls. The tripod mounted microphones were placed in positions that approximated the likely positions of the beds within the bedrooms and a sofa within the living room area. The microphones were connected to the sound level meters via 5 metre extension cables, so permitting the operator to remain outside the assessment spaces. The measurements were unmanned for their duration.

6.0 Construction Specification

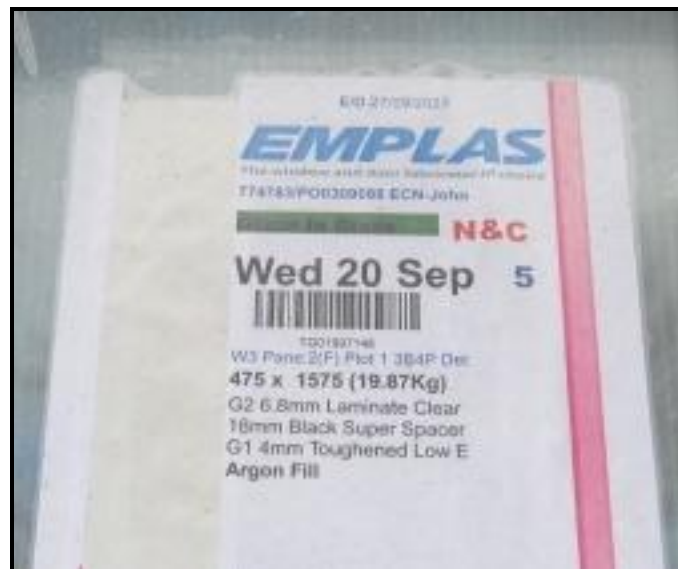
Prior to conducting the noise validation survey, the glazing and ventilation units installed within plot 1 were inspected to assess compliance with the items specified within the 'Noise Impact Assessment' report. Reference to the mitigation measures presented within the 'Noise Impact Assessment' report suggests that the 'option 3' mitigation measures should have been applied to the front façade of the dwelling. In this case the option 3 mitigation measures required glazing capable of providing a sound insulation value of at least 27dB $R_w + C_{tr}$ and a ventilator capable of providing a sound insulation value of at least 38dB $D_{ne,w}$.

No specific requirement was produced for the rear façade of the plot, however reference to the figure contained within Appendix 3a of the 'Noise Impact Assessment' report, reproduced in section 4 above, indicates that the sound insulation of the glazing and ventilation units for the houses further into the development should comply with an option one specification. In this case an option one specification would be glazing capable of providing a sound insulation value of at least 27dB $R_w + C_{tr}$ and a ventilator capable of providing a sound insulation value of at least 27dB $D_{ne,w}$.

6.1 Glazing

The glazing specification of the windows to the living room and the front and rear bedrooms was detailed on the manufacturer labels that had been left stuck to the external surface of the sealed units. Photographs 5 and 6 below and overleaf highlight the glazing specifications for the living room and the front and rear bedroom respectively.

Photograph 5. Glazing sticker, living room, plot 1



Photograph 6. Glazing sticker, front and rear bedrooms, plot 1



A further check of the overall thickness of the installed sealed units was conducted using a Bohle Glass Check glass thickness gauge, as detailed in photograph 7 below, which revealed that the thickness of the sealed unit glazing was 28mm. This would accord with the overall thickness for the two sealed unit glazing specifications detailed in photographs 5 and 6 above. Consequently, it is suggested that the installed glazing complies with the suggested mitigation measures contained within table 9 of the noise impact assessment report, summarised in section 4 above.

Photograph 7. Measured thickness of the sealed unit glazing, plot 1 - front bedroom



6.2 Ventilation

In the case of the option three mitigation the 'Noise Impact Assessment' report required that the ventilation should be capable of providing a sound insulation value of at least 38dB $D_{ne,w}$ in the open position, with the option one mitigation being the provision of a ventilator capable of providing a sound insulation value of at least 27dB $D_{ne,w}$ in the open position.

On site assessment revealed that the ventilation provision on the front elevation comprised a Titan V75/C75 acoustic ventilator, as detailed in photograph 8 below, with the ventilation provision on the rear elevation being of the Glazpart Linkvent type 5000. Reference to manufacturer's data indicates that the Titan and Glazpart ventilators are capable of providing sound insulation values of 44 and 31dB $D_{ne,w}$ in their open positions. This being the case it can be seen that the sound insulation provided by both ventilators would comply with the mitigation requirements detailed within the noise assessment report.

Photograph 8. Titan V75/C75 acoustic ventilator, plot 1 - front bedroom



7.0 Noise Survey Results

At the time of the internal noise measurements, plot 1 was complete, unfurnished and unoccupied. As a consequence it was likely that the sound absorption of the rooms used in the assessment would be different to that which would prevail when the house was occupied and furnished. In order to permit the obtained sound levels to be standardised, sample reverberation time measurements were made within the three assessed rooms within plot 1. The mean reverberation times are presented in table 3 overleaf.

Table 3. Mean reverberation time measurements, plot 1

Room	Mean Reverberation Time, T_{20} , seconds
Front bedroom	1.69
Rear bedroom	1.33
Living room	0.77

For the purposes of the subsequent assessments the measured internal ambient noise levels will be 'standardised' to a reverberation time of 0.5 seconds, which would be typical of a furnished and occupied dwelling.

By virtue of the significant amounts of measured noise data collected during the noise surveys, tables 4 - 6 below and overleaf and graphs 1 - 3 overleaf contain summaries of the noise data from the measurement surveys. Full measured noise data are presented in tabular form in Appendix 1. With reference to the daytime period, it should be remembered that this covered a seven hour period, between 16:00 - 23:00 hours, only. As previously discussed, the daytime period was truncated to exclude any construction noise from the development. Despite this, as the assessment period included the evening peak period, it is suggested that the obtained result would be representative of the full 16 hour daytime period.

Table 4. Standardised internal sound level summary, front bedroom

	$L_{Aeq,T}$	$L_{Amax,T}$
Standard deviation, daytime	2.97	-
Standard deviation, night time	4.47	5.83
Daytime mean (log)	34	-
Night time mean (log)	26	39
Daytime modal value	32	-
Night time modal value	21	33

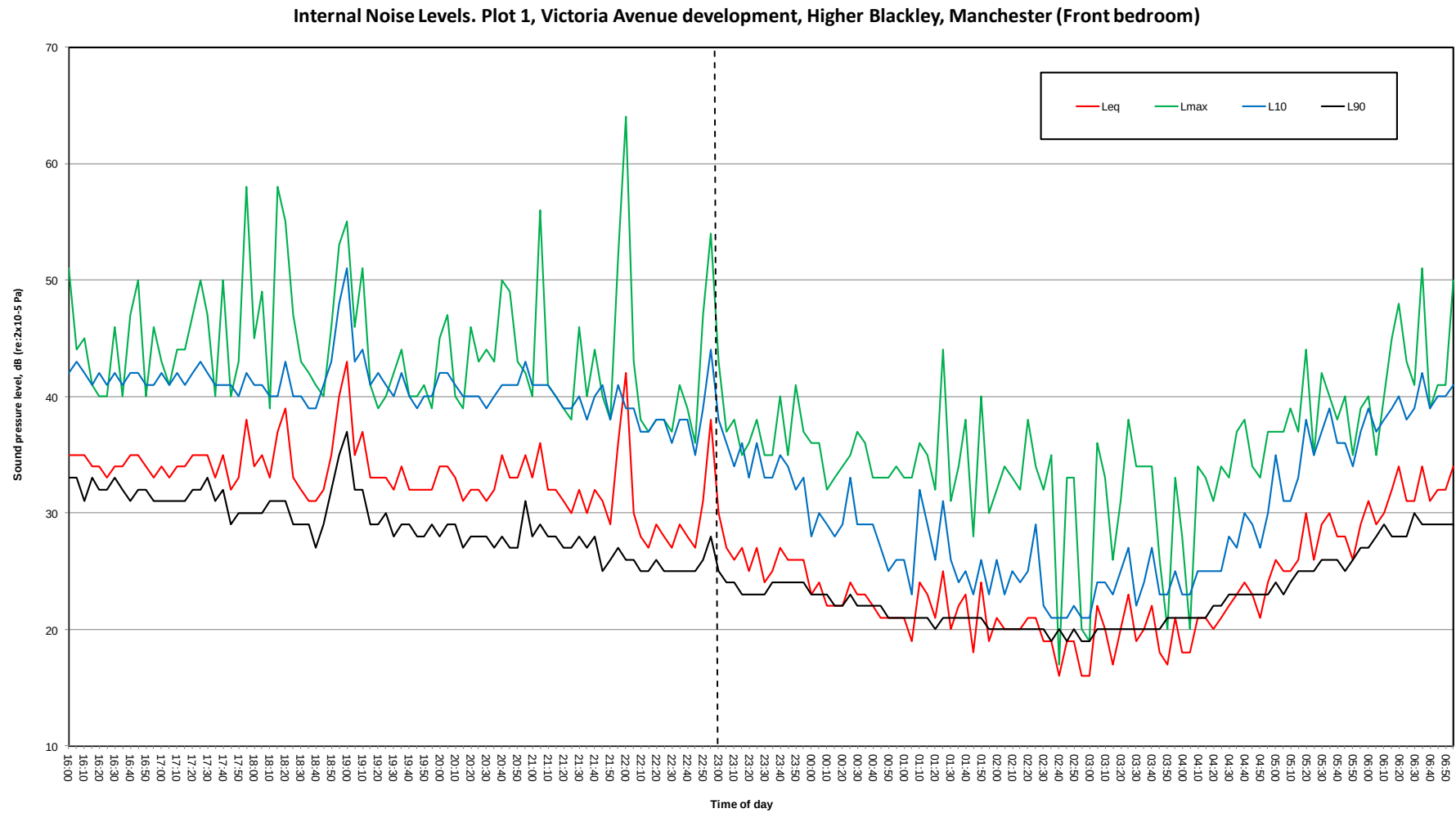
Table 5. Standardised internal sound level summary, rear bedroom

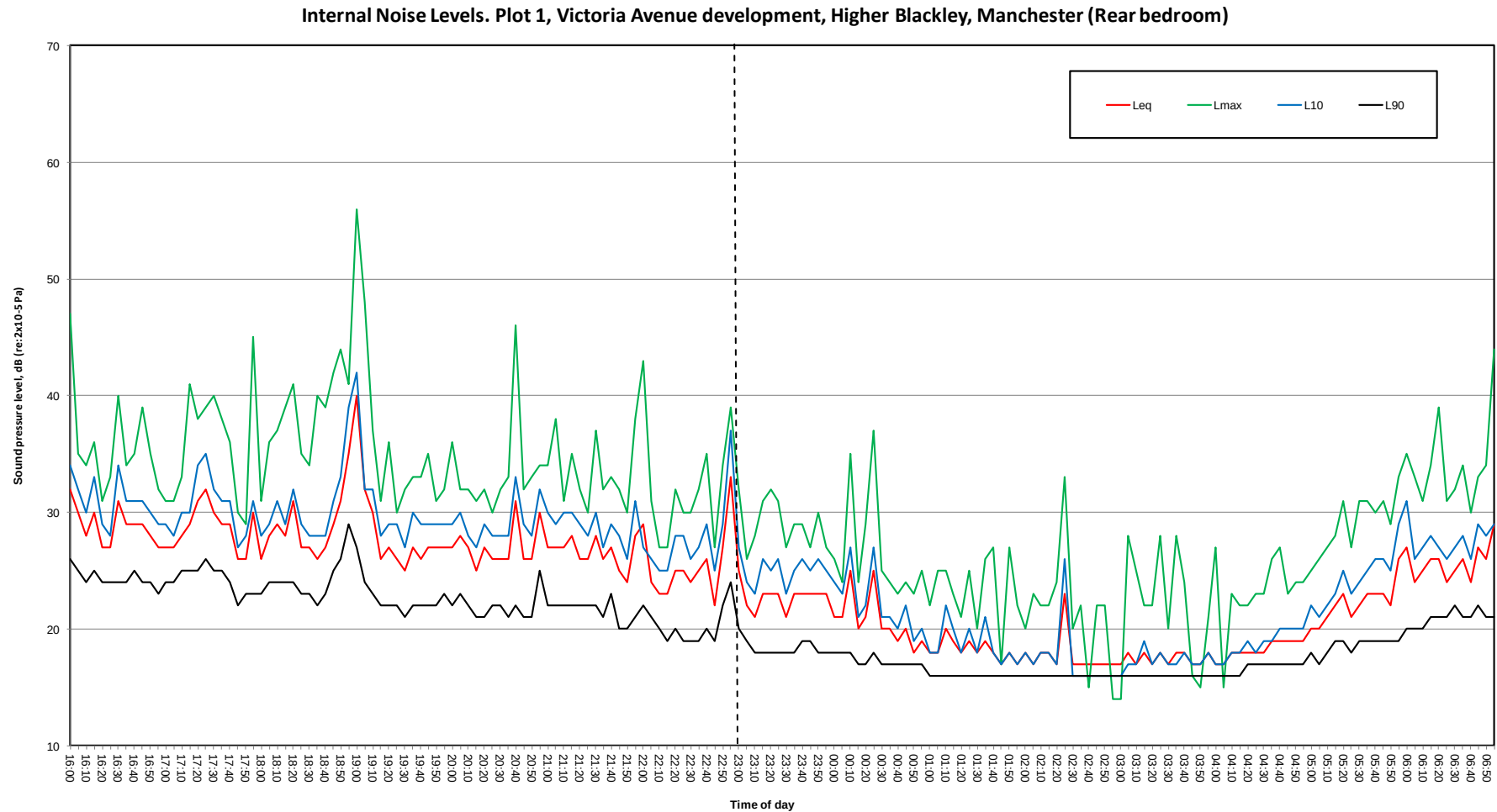
	$L_{Aeq,T}$	$L_{Amax, T}$
Standard deviation, daytime	2.71	-
Standard deviation, night time	3.10	5.52
Daytime mean (log)	29	-
Night time mean (log)	22	30
Daytime modal value	27	-
Night time modal value	18	22

Table 6. Standardised internal sound level summary, living room

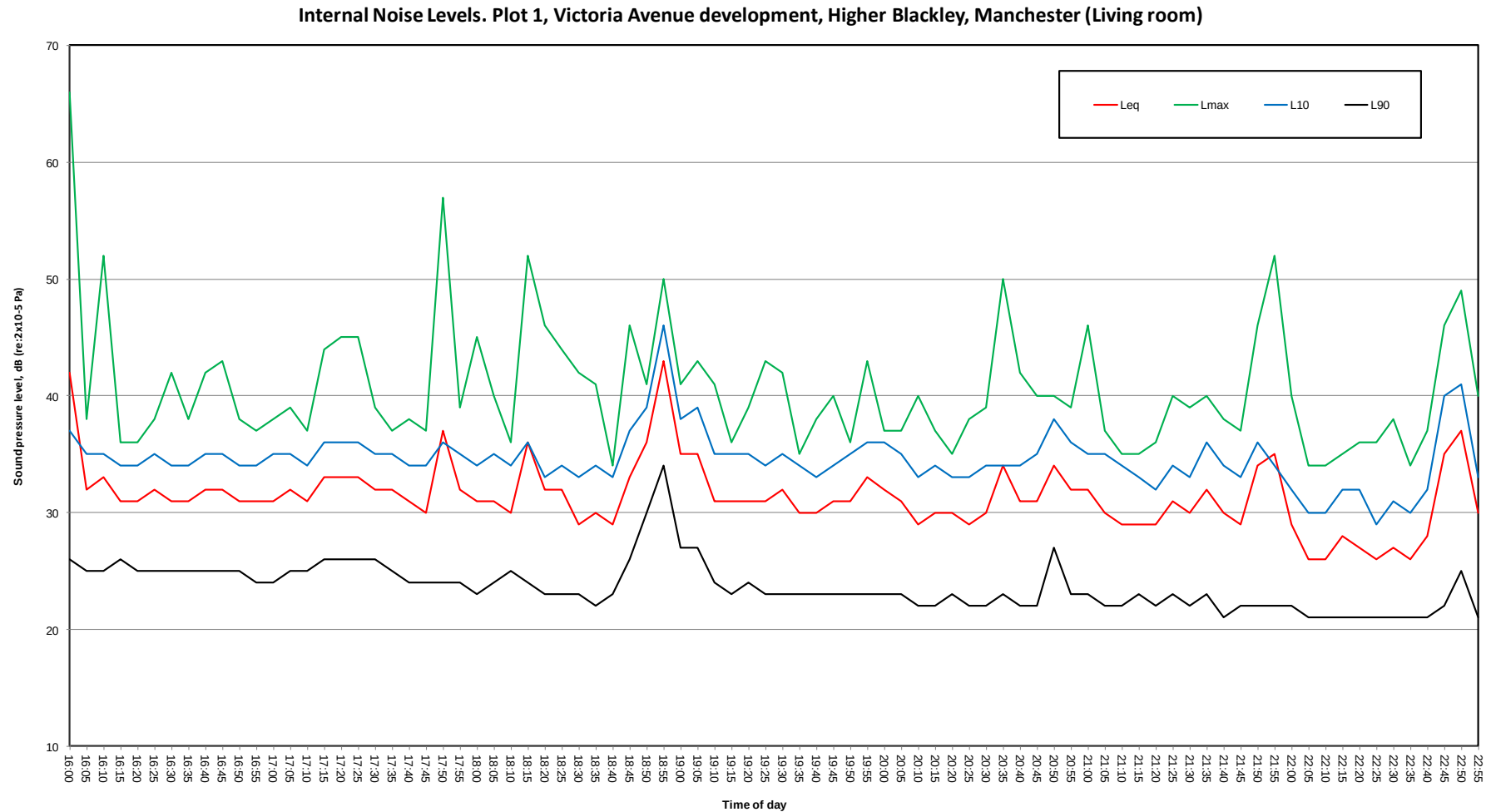
	$L_{Aeq,T}$	$L_{Amax, T}$
Standard deviation, daytime	2.91	-
Daytime mean (log)	33	-
Daytime modal value	31	-

Graph 1. Standardised sound level summary, front bedroom, plot 1



Graph 2. Standardised sound level summary, rear bedroom, plot 1

Graph 3. Standardised sound level summary, living room, plot 1



8.0 Discussion

With reference to the design guide values presented within section 4 of this report and reproduced from the 'Noise Impact Assessment' report, the guidance relating to the internal noise climate recommends that the daytime noise climate should not exceed 35dB L_{Aeq} within habitable rooms, reducing to 30dB L_{Aeq} within the bedrooms at night. With respect to the measured levels resulting from this assessment of the internal noise climate, the standardised sound levels obtained from the front and rear bedrooms and the living room of plot 1 highlighted that the mean (log) day and night time levels, as appropriate, did not exceed the daytime and night time design guide values.

Turning to the L_{Amax} levels within the bedrooms at night, it can be seen that within the front bedroom the night time L_{Amax} guide level of 45dB was exceeded on three occasions: 06:20, 06:35 and 06:50 hours during the night time period. Despite this, it must be remembered that the guidance contained within the Manchester City Council and ProPG document suggest that up to 15 and 10 exceedances respectively of this parameter would be acceptable. As such the L_{Amax} climate within the front bedroom was deemed to be acceptable. As the 45dB L_{Amax} guide value was not exceeded at all within the rear bedroom, it is again suggested that the L_{Amax} climate within the rear bedroom was deemed to be acceptable.

Consequently, it is suggested that the requirement within planning condition 16b to produce a *"verification report... to confirm that the noise criteria have been met"* has been complied with. In addition it is suggested that the results obtained for plot 1 should provide an indication of the situation within the remaining plots on the development.

9.0 Conclusion

Measurements of the internal noise climate resulting from external noise break-in, have been made within plot 1 on the Victoria Avenue development in Higher Blackley, Manchester. The results of the break-in noise survey have demonstrated that the internal noise climate within the front and rear bedrooms and the living room, complied with the design guide values contained within the noise impact assessment. As such, it is suggested that the requirement contained within planning condition 16b, relating to the internal noise climate within the dwellings, has been complied with.

Appendix 1. Standardised Internal Noise Levels

Front bedroom, standardised internal noise levels

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
16:00	35	51	42	33
16:05	35	44	43	33
16:10	35	45	42	31
16:15	34	41	41	33
16:20	34	40	42	32
16:25	33	40	41	32
16:30	34	46	42	33
16:35	34	40	41	32
16:40	35	47	42	31
16:45	35	50	42	32
16:50	34	40	41	32
16:55	33	46	41	31
17:00	34	43	42	31
17:05	33	41	41	31
17:10	34	44	42	31
17:15	34	44	41	31
17:20	35	47	42	32
17:25	35	50	43	32
17:30	35	47	42	33
17:35	33	40	41	31
17:40	35	50	41	32
17:45	32	40	41	29
17:50	33	43	40	30
17:55	38	58	42	30

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
18:00	34	45	41	30
18:05	35	49	41	30
18:10	33	39	40	31
18:15	37	58	40	31
18:20	39	55	43	31
18:25	33	47	40	29
18:30	32	43	40	29
18:35	31	42	39	29
18:40	31	41	39	27
18:45	32	40	41	29
18:50	35	46	43	32
18:55	40	53	48	35
19:00	43	55	51	37
19:05	35	46	43	32
19:10	37	51	44	32
19:15	33	41	41	29
19:20	33	39	42	29
19:25	33	40	41	30
19:30	32	42	40	28
19:35	34	44	42	29
19:40	32	40	40	29
19:45	32	40	39	28
19:50	32	41	40	28
19:55	32	39	40	29

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
20:00	34	45	42	28
20:05	34	47	42	29
20:10	33	40	41	29
20:15	31	39	40	27
20:20	32	46	40	28
20:25	32	43	40	28
20:30	31	44	39	28
20:35	32	43	40	27
20:40	35	50	41	28
20:45	33	49	41	27
20:50	33	43	41	27
20:55	35	42	43	31
21:00	33	40	41	28
21:05	36	56	41	29
21:10	32	41	41	28
21:15	32	40	40	28
21:20	31	39	39	27
21:25	30	38	39	27
21:30	32	46	40	28
21:35	30	40	38	27
21:40	32	44	40	28
21:45	31	40	41	25
21:50	29	38	38	26
21:55	36	52	41	27

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
22:00	42	64	39	26
22:05	30	43	39	26
22:10	28	38	37	25
22:15	27	37	37	25
22:20	29	38	38	26
22:25	28	38	38	25
22:30	27	37	36	25
22:35	29	41	38	25
22:40	28	39	38	25
22:45	27	36	35	25
22:50	31	47	39	26
22:55	38	54	44	28
23:00	30	43	38	25
23:05	27	37	36	24
23:10	26	38	34	24
23:15	27	35	36	23
23:20	25	36	33	23
23:25	27	38	36	23
23:30	24	35	33	23
23:35	25	35	33	24
23:40	27	40	35	24
23:45	26	35	34	24
23:50	26	41	32	24
23:55	26	37	33	24

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
00:00	23	36	28	23
00:05	24	36	30	23
00:10	22	32	29	23
00:15	22	33	28	22
00:20	22	34	29	22
00:25	24	35	33	23
00:30	23	37	29	22
00:35	23	36	29	22
00:40	22	33	29	22
00:45	21	33	27	22
00:50	21	33	25	21
00:55	21	34	26	21
01:00	21	33	26	21
01:05	19	33	23	21
01:10	24	36	32	21
01:15	23	35	29	21
01:20	21	32	26	20
01:25	25	44	31	21
01:30	20	31	26	21
01:35	22	34	24	21
01:40	23	38	25	21
01:45	18	28	23	21
01:50	24	40	26	21
01:55	19	30	23	20

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
02:00	21	32	26	20
02:05	20	34	23	20
02:10	20	33	25	20
02:15	20	32	24	20
02:20	21	38	25	20
02:25	21	34	29	20
02:30	19	32	22	20
02:35	19	35	21	19
02:40	16	17	21	20
02:45	19	33	21	19
02:50	19	33	22	20
02:55	16	20	21	19
03:00	16	19	21	19
03:05	22	36	24	20
03:10	20	33	24	20
03:15	17	26	23	20
03:20	20	31	25	20
03:25	23	38	27	20
03:30	19	34	22	20
03:35	20	34	24	20
03:40	22	34	27	20
03:45	18	26	23	20
03:50	17	20	23	21
03:55	21	33	25	21

Time	$L_{Aeq, 5 \text{ mins}}$	$L_{Amax, 5 \text{ mins}}$	$L_{A10, 5 \text{ mins}}$	$L_{A90, 5 \text{ mins}}$
04:00	18	28	23	21
04:05	18	20	23	21
04:10	21	34	25	21
04:15	21	33	25	21
04:20	20	31	25	22
04:25	21	34	25	22
04:30	22	33	28	23
04:35	23	37	27	23
04:40	24	38	30	23
04:45	23	34	29	23
04:50	21	33	27	23
04:55	24	37	30	23
05:00	26	37	35	24
05:05	25	37	31	23
05:10	25	39	31	24
05:15	26	37	33	25
05:20	30	44	38	25
05:25	26	35	35	25
05:30	29	42	37	26
05:35	30	40	39	26
05:40	28	38	36	26
05:45	28	40	36	25
05:50	26	35	34	26
05:55	29	39	37	27

[illegible]

Rear bedroom, standardised internal noise levels

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
16:00	32	47	34	26
16:05	30	35	32	25
16:10	28	34	30	24
16:15	30	36	33	25
16:20	27	31	29	24
16:25	27	33	28	24
16:30	31	40	34	24
16:35	29	34	31	24
16:40	29	35	31	25
16:45	29	39	31	24
16:50	28	35	30	24
16:55	27	32	29	23
17:00	27	31	29	24
17:05	27	31	28	24
17:10	28	33	30	25
17:15	29	41	30	25
17:20	31	38	34	25
17:25	32	39	35	26
17:30	30	40	32	25
17:35	29	38	31	25
17:40	29	36	31	24
17:45	26	30	27	22
17:50	26	29	28	23
17:55	30	45	31	23

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
18:00	26	31	28	23
18:05	28	36	29	24
18:10	29	37	31	24
18:15	28	39	29	24
18:20	31	41	32	24
18:25	27	35	29	23
18:30	27	34	28	23
18:35	26	40	28	22
18:40	27	39	28	23
18:45	29	42	31	25
18:50	31	44	33	26
18:55	35	41	39	29
19:00	40	56	42	27
19:05	32	48	32	24
19:10	30	37	32	23
19:15	26	31	28	22
19:20	27	36	29	22
19:25	26	30	29	22
19:30	25	32	27	21
19:35	27	33	30	22
19:40	26	33	29	22
19:45	27	35	29	22
19:50	27	31	29	22
19:55	27	32	29	23

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
20:00	27	36	29	22
20:05	28	32	30	23
20:10	27	32	28	22
20:15	25	31	27	21
20:20	27	32	29	21
20:25	26	30	28	22
20:30	26	32	28	22
20:35	26	33	28	21
20:40	31	46	33	22
20:45	26	32	29	21
20:50	26	33	28	21
20:55	30	34	32	25
21:00	27	34	30	22
21:05	27	38	29	22
21:10	27	31	30	22
21:15	28	35	30	22
21:20	26	32	29	22
21:25	26	30	28	22
21:30	28	37	30	22
21:35	26	32	27	21
21:40	27	33	29	23
21:45	25	32	28	20
21:50	24	30	26	20
21:55	28	38	31	21

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
22:00	29	43	27	22
22:05	24	31	26	21
22:10	23	27	25	20
22:15	23	27	25	19
22:20	25	32	28	20
22:25	25	30	28	19
22:30	24	30	26	19
22:35	25	32	27	19
22:40	26	35	29	20
22:45	22	27	25	19
22:50	27	34	29	22
22:55	33	39	37	24
23:00	25	32	27	20
23:05	22	26	24	19
23:10	21	28	23	18
23:15	23	31	26	18
23:20	23	32	25	18
23:25	23	31	26	18
23:30	21	27	23	18
23:35	23	29	25	18
23:40	23	29	26	19
23:45	23	27	25	19
23:50	23	30	26	18
23:55	23	27	25	18

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
00:00	21	26	24	18
00:05	21	24	23	18
00:10	25	35	27	18
00:15	20	24	21	17
00:20	21	29	22	17
00:25	25	37	27	18
00:30	20	25	21	17
00:35	20	24	21	17
00:40	19	23	20	17
00:45	20	24	22	17
00:50	18	23	19	17
00:55	19	25	20	17
01:00	18	22	18	16
01:05	18	25	18	16
01:10	20	25	22	16
01:15	19	23	20	16
01:20	18	21	18	16
01:25	19	25	20	16
01:30	18	20	18	16
01:35	19	26	21	16
01:40	18	27	18	16
01:45	17	17	17	16
01:50	18	27	18	16
01:55	17	22	17	16

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
02:00	18	20	18	16
02:05	17	23	17	16
02:10	18	22	18	16
02:15	18	22	18	16
02:20	17	24	17	16
02:25	23	33	26	16
02:30	17	20	16	16
02:35	17	22	16	16
02:40	17	15	16	16
02:45	17	22	16	16
02:50	17	22	16	16
02:55	17	14	16	16
03:00	17	14	16	16
03:05	18	28	17	16
03:10	17	25	17	16
03:15	18	22	19	16
03:20	17	22	17	16
03:25	18	28	18	16
03:30	17	20	17	16
03:35	18	28	17	16
03:40	18	24	18	16
03:45	17	16	17	16
03:50	17	15	17	16
03:55	18	21	18	16

[illegible]

Living room, standardised internal noise levels

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
16:00	42	66	37	26
16:05	32	38	35	25
16:10	33	52	35	25
16:15	31	36	34	26
16:20	31	36	34	25
16:25	32	38	35	25
16:30	31	42	34	25
16:35	31	38	34	25
16:40	32	42	35	25
16:45	32	43	35	25
16:50	31	38	34	25
16:55	31	37	34	24
17:00	31	38	35	24
17:05	32	39	35	25
17:10	31	37	34	25
17:15	33	44	36	26
17:20	33	45	36	26
17:25	33	45	36	26
17:30	32	39	35	26
17:35	32	37	35	25
17:40	31	38	34	24
17:45	30	37	34	24
17:50	37	57	36	24
17:55	32	39	35	24

Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
18:00	31	45	34	23
18:05	31	40	35	24
18:10	30	36	34	25
18:15	36	52	36	24
18:20	32	46	33	23
18:25	32	44	34	23
18:30	29	42	33	23
18:35	30	41	34	22
18:40	29	34	33	23
18:45	33	46	37	26
18:50	36	41	39	30
18:55	43	50	46	34
19:00	35	41	38	27
19:05	35	43	39	27
19:10	31	41	35	24
19:15	31	36	35	23
19:20	31	39	35	24
19:25	31	43	34	23
19:30	32	42	35	23
19:35	30	35	34	23
19:40	30	38	33	23
19:45	31	40	34	23
19:50	31	36	35	23
19:55	33	43	36	23

[illegible]